ANSBERG, Ye.A., assistent; BOROVITSKIY, V.P., dots.; BUTS, Sh.F., dots.; Prinimali uchastiye: SERGEYEV, V.A., dots.; SAMARINA, V.S., st. nauchn. sotr.; SKORYNINA, N.P., red.

[Practice in general hydrogeology] Praktikum po obshchei gidrogeologii. Leningrad, Izd-vo Leningr. univ., 1965. 231 p. (MIRA 18:4)

1. Kafedra gidrogeologii Leningradskogo gosudarstvennogo universiteta im. A.A.Zhdanova (for Buts, Ansberg, Sergeyev). 2. Institut Zemnoy kory, Leningrad (for Samarina). 3. Gornyy institut, Leningrad (for Borovitskiy).

SAMARINA, V.V., Cand Med Sci -- (diss) "Comparative evaluation of certain functional ~~probes~~ tests of the liver in Botkin's disease." Minsk, 1958, 14 pp (Minsk State Med Inst) 200 copies (KL, 28-58, 111)

26294
S/190/61/003/008/007/019
B110/B218

15,8050

AUTHORS: Razuvayev, G. A., Etlis, V. S., Kirillov, N. I., Samarina, Ye. M.

TITLE: New peroxide compounds obtained on the basis of cyclic ketones as initiators for polymerization of vinyl compounds

PERIODICAL: Vysokomolekulyarnyye soyedineniya, v. 3, no. 8, 1961, 1176-1180

TEXT: Since arylated or acylated derivatives of hydroxycyclohexyl hydroperoxides are good initiators for radical polymerizations, the authors aimed at synthesizing alkyloxy formylated derivatives of bis-(1-hydroperoxycycloalkyl)-peroxides having the general formula $R_1O-\underset{\underset{O}{\|}}{C}-OO-R_2-OO-R_2-OO-\underset{\underset{O}{\|}}{C}-OR_1$, where $R_1 = CH_3$, C_2H_5, C_6H_{11}; R_2 = gem-cyclohexyl and gem-cyclopentyl. Synthesis proceeded according to the equation:

$$MeOO-R_2-OO-R_2-OOMe + 2\ R_1O-\underset{\underset{O}{\|}}{C}-Cl \longrightarrow R_1O-\underset{\underset{O}{\|}}{C}-OO-R_2-OO-R_2-OO-\underset{\underset{O}{\|}}{C}-OR_1 + 2\ MeCl;$$

(Me = alkali metal). It was performed under virulent stirring in

Card 1/5

X

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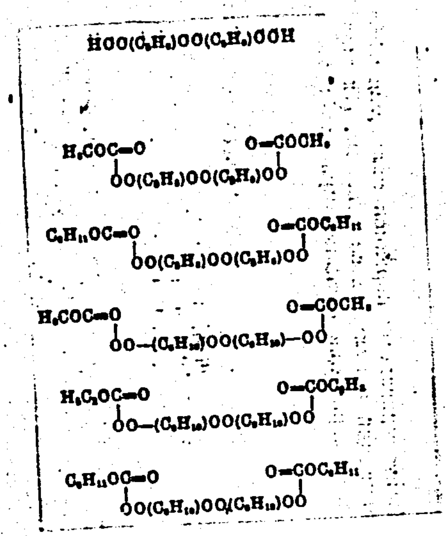
New peroxide compounds obtained on ...

low-boiling hydrocarbons which served as a medium, and at a temperature of T $\sim 5^{\circ}$C. The alkali salts of the initial dihydroperoxides were obtained in ether solution from the hydroxides of the alkali metals and bis-(1-hydroperoxycycloalkyl)-peroxide. The following structural formulas of the peroxides synthesized are given:

X

Card 2/5

New peroxide compounds obtained on ...



Card 3/5

26294
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B110/B218

New peroxide compounds obtained on ...

The authors also made an attempt to obtain bis-1(-alkylpercarbonate-cycloalkyl)-peroxides directly from the hydroperoxides and esters of chlorocarbonic acid, in the presence of pyridine, which failed since the final product could not be isolated in pure form. The compounds synthesized are white, crystalline substances, readily soluble in diethyl ether, acetone, benzene, poorly soluble in alcohols and hydrocarbons, and unsoluble in H_2O. The substance decomposes at melting temperature and explodes above 150°C, especially on friction or impact. Measurements of the polymerization rate of vinyl chloride (10% at 45°C, 0.05 mole% of initiator) and of methyl methacrylate led to the following results: (1) the initial bis-(1-hydroperoxycycloalkyl)-peroxides exhibit the same initiating effect as benzoyl peroxide; (2) bis-(1-alkylpercarbonate-cyclohexyl)-peroxides have the two-fold, and (3) the corresponding cyclopentyl compounds have the three-fold initiating effect as compared to benzoyl peroxide. In addition, the authors found that with both cyclohexyl and cyclopentyl compounds the above effect depended on R_1 in the following order: $C_6H_{11} < C_2H_5 < CH_3$. There are 1 figure, 2 tables, and 8 references: 2 Soviet and 6 non-Soviet.

Card 4/5

26294
S/190/61/003/008/007/019
B110/B218

New peroxide compounds obtained on ...

The three most important references to English-language publications read as follows: Ref. 1: W. Cooper, J. Chem. Soc., 1951, 1340; Ref. 5: M. S. Kharasch, G. Sosnovsky, J. Org. Chem., 23, 1322, 1958; Ref. 8: N. Milas, J. Amer. Chem. Soc., 61, 2430, 1939.

SUBMITTED: October 7, 1960

X

Card 5/5

YAKUBSON, A.K., prof.; SAMARINA, Z.N. (Novosibirsk)

Clinical aspects of exudative erythema multiforme (Stevens-Johnson syndrome). Klin. med. 41 no.6:22-27 Je '63. (MIRA 17:1)

1. Iz kliniki kozhnykh i venericheskikh bolezney (zav. - prof. A.K. Yakubson) Novosibirskogo meditsinskogo instituta.

SAMARKANDZHEV, T.

(11)

Sofia, Veterinarna [illegible], [illegible] (163)

1. (Unsigned editorial): Morbidity and [illegible] lity of Domestic Animals During the Spring Season, pp 1-2.

2. (Unsigned editorial): Increasing the Level of Education in Veterinary Medicine - Animal Husbandry, pp 3-4.

3. Iordan [illegible] (Director of RVI /Raionniyat Veterinaren Institut = District Veterinary Institute/ in Trnovo): Thirty Years of Service to Animal Health, pp 5-6.

4. Dr Dimitr [illegible] (RVS = District Veterinary Station in Varna): [illegible] Disease in Suckling Pigs from 2-3 Days, pp 9-10.

5. Dr Ivan [illegible] (RVS in [illegible]): Rapid Diagnostic Test for Swine Cholera, pp 10-12.

6. Dimitr [illegible] and Milan [illegible]: Infectious [illegible] in [illegible], pp 12-13.

7. Dr N. [illegible] and Dr [illegible]: Case of Acute Hydatigenous Cysticercosis in [illegible], pp 14.

8. Dr Emil [illegible] (Veterinary Practitioner): Therapy and Prevention of [illegible] in [illegible], pp 15-[illegible].

9. Dr Nikola [illegible] (GVS /City Veterinary Station/ in [illegible]): [illegible] Poisoning with [illegible]-Contaminated Oats [illegible], pp 17-20.

10. Dr Todor [illegible] ([illegible], Department of Surgery and [illegible] Hospital in [illegible]): Cesarean Section in [illegible], [illegible].

11. Bogomil [illegible] ([illegible] Physician, Village of Svetlin, [illegible]): Treatment of Diarrhea in Piglets and Calves with [illegible] and Streptomycin, pp 23-25.

— 1/1 —

SAMARKIN, D. N.

"Principles of Watering Soviet Fine-Fibered Cotton in Crop Rotation." Min. Higher Education USSR, Tashkent Agricultural Inst., Tashkent, 1955. (Dissertation for the Degree of Candidate in Agricultural Sciences)

SO: Knizhnaya Letopis', No. 22, 1955, pp 93-105

Q

COUNTRY : USSR
CATEGORY : Farm Animals.
The Honeybee.
ABS. JOUR. : RZhBiol., No. 6, 1959, No. 25938

AUTHOR : Ankinovich, G.; Dem'yanova, I.; Samarkin, I.
INST. : -
TITLE : Some Practices of Taking Bees Out to Gather Honey.

ORIG. PUB. : Pchelovodstvo, 1958, No 7, 22-26

ABSTRACT : In an industrial experiment lasting several years it was established that natural swarming during the time of the main honey collection does not impede obtaining high honey yields.

CARD: 1/1

SAMARKIN, V. G.

33235. Primeneniye Samorazruzhayushchikhsya Tsentrifug Dlya Fugovki Utfeley ii Produkta. Caxapl Prom-St', 1949, No, 10, c. 36

SO: Letopis' Zhurnal'nykh Statey, Vol. 45, Moskva, 1949

SAMAROV, A. A., ed.

Russia (1923- U.S.S.R.) The development of mine weapons in the Russian navy; documents. Moskva, Voennomorskoe izd-vo, 1951. 349 p. maps. (52-40219)

APPROVED FOR RELEASE: 08/25/2000 CIA-RDP86-00513R001446920009-

SAMAROV, A.A., redaktor; IGNATKOVICH, G.M., redaktor; SOLOV'YEV, N.I., redaktor; SOLOMONIK, R.L., tekhnicheskiy redaktor

[N.S.Nakhimov; documents and materials] P.S.Nakhimov; dokumenty i materialy. Pod red. A.A.Samarova. Moskva, Voen. izd-vo Ministerstva oborony SSSR, 1954. 831 p. (MLRA 8:3)

1. Russia (1923- U.S.S.R.) TSentral'nyy gosudarstvennyy arkhiv Voyenno-Morskogo Flota.
(Nakhimov, Pavel Stepanovich, 1803-1855)

SAMAROV, A.B.

Theorem on integral inequalities for a discontinuous Uryson operator. Uch. zap. Kaz. un. 124 no.6:278-283 '64. (MIRA 18:9)

ADAMASHVILI, Yu.D.; ZIMINA, K.Kh.; PLATONOV, V.A.; LIKHOVITSKIY, A.A.; SAMAROV, A.V.; SVECHINSKIY, V.L.

Some problems in the planning of cities and settlements in districts of the Far North and Northeast. Stroi. v raion. Vost. Sib. i Krain. Sev. no.2:28-40 '62. (MIRA 18:7)

SAMAROV, G. A.

7688. SAMAROV, G. A. I. CHEREMNYKH, A. I. - Modelirovaniye i Konstruirovaniye muzhskoy verkhney odezhdy. izd. 3ye, dop. i pererabot. M., Gizlegprom, 1954. 236s.s ill: 1L. chert.23sm. 100.000 ekz. (1-20tys.) 8 R. 40 K. V. per-(55-4276) 687.11.022

SO: Knizhnaya Letopis', Vol. 7, 1955

SAMAROV, Grigoriy Abramovich; CHEREMNYKH, Aleksandr Ivanovich; SOSULINA, V.N., redaktor; MEDVEDEV, B.Ya., tekhnicheskiy redaktor.

[The modeling and cutting of men's suits and coats] Modelirovanie i konstruirovanie muzhskoi verkhnei odezhdy. Izd. 3-e dop. i perer. Moskva, Gos.nauchno-tekhn.izd-vo Ministerstva promyshlennykh tovarov shirokogo potrebleniia SSSR, 1955. 234 p. (MIRA 8:4)
(Tailoring)

APPROVED FOR RELEASE: 08/25/2000 CIA-RDP86-00513R001446920009-6"

CHEREMNYKH, Aleksandr Ivanovich; SAMAROV, Grigoriy Abramovich; RAZBASH, Isaak Yakovlevich, dotsent; VINOGRADOV, S.K., retsenzent; ISLANKINA, T.F., red.; MEDVEDEV, L.Ya., tekhn.red.

[Designing of women's clothing] Konstruirovanie verkhnei zhenskoi odezhdy. Moskva, Gos.nauchno-tekhn.izd-vo lit-ry po legkoi promyshl., 1959. 142 p. (MIRA 13:9)
(Dressmaking--Pattern design)

84-58-2-26/46

G.

AUTHOR: Samarov, N., Engineer

TITLE: Lubrication Servicing of an Engine (Maslyanaya podgotovka dvigatelya)

PERIODICAL: Grazhdanskaya aviatsiya, 1958, Nr 2, p 25 (USSR)

ABSTRACT: The article deals with the problem of lubrication of ASh-62 and ASh-82 piston engines, under test conditions, when the ambient temperature is considerably below the freezing point. An additional electrically driven oil pump was added to the test installation, which forces the lubricant, through a special pipe, directly into the crankshaft system of the engine. An electrical heating system is provided to warm up the oil piping instead of the usual steam system. The assembly is recommended for use by the aircraft repair establishments as well as by the line maintenance workshops. A diagram, showing the general layout of the system, accompanies the text.

AVAILABLE: Library of Congress

Card 1/1 1. Airplane engines - Lubrication

ACC NR: AP6029622 (N) SOURCE CODE: UR/0114/66/000/008/0029/0031

AUTHOR: Samarov, N. G. (Candidate of technical sciences)

ORG: none

TITLE: Determining the location and degree of unbalance of a flexible, all-regime rotor

SOURCE: Energomashinostroyeniye, no. 8, 1966, 29-31

TOPIC TAGS: turbine rotor, compressor rotor, rotor unbalance, mechanical vibration, vibration analysis

ABSTRACT: A method permitting the establishment of the exact degree and location of unbalance of flexible all-regime turborotors without disassembly is described. It was found that by analyzing the vibration characteristics of the turbomachine, and comparing them with previously known vibration amplitudes, the location and amount of the unbalance along the length of the rotor can be determined. The investigation showed that for practical purposes it is sufficient to compare the degree of deflection for only two of the shaft's critical angular velocity regimes; i.e., $\omega_{crit} = 0.5$ and 0.71, for in calculating the degree of shaft deflection, whole numbers are obtained at these regimes. The investigation showed that it is possible to determine with a certain degree of accuracy, not only the location of unbalance, but also its degree, by shifting the center of gravity. It was proven experimentally that for each typical case of unbalance at the predetermined regimes, the definite relation

 UDC: 62-25-755.001.2

ACC NR: AP6029622

A_2/A_1 exists. ($A_1 = 0.5\ \omega_{crit}$, $A_2 = 0.71\ \omega_{crit}$). The theoretical results were found to be in good agreement with experimental data. Orig. art. has: 3 figures, 1 table, and 11 formulas.

SUB CODE: 21/ SUBM DATE: none/ ORIG REF: 003

APPROVED FOR RELEASE: 08/25/2000 CIA-RDP86-00513R001446920009-6"

80965
S/147/60/000/02/016/020
E191/E481

24.4100
10.2000

AUTHOR: Samarov, N.G. (Moscow)

TITLE: The Elastic Unbalance in Multi-Disc Turbo-Jet Engine Rotors

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Aviatsionnaya tekhnika, 1960, Nr 2, pp 138-143 (USSR)

ABSTRACT: "Elastic unbalance" stands for the unbalance caused by the elastic deflection of the rotor in operation as a result of an initial residual unbalance after balancing. A multi-disc rotor is considered which has been balanced when assembled by compensating masses in two transverse planes, situated near the bearing. The separate effect of a shift of the centre of gravity of an individual disc from the axis of rotation is examined insofar as it causes elastic unbalance. Built-up turbo-jet engine rotors with axial compressors are balanced in the assembled state but unbalances of individual discs nevertheless cause elastic deflections. First, the elastic unbalance is derived for a rotor having a residual unbalance in the assembled state. The total centrifugal force consists of a term proportional to the fourth

Card 1/3

APPROVED FOR RELEASE: 08/25/2000 CIA-RDP86-00513R001446920009-6"

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S/147/60/000/02/016/020
E191/E481

The Elastic Unbalance in Multi-Disc Turbo-Jet Engine Rotors

power of the rotational speed which is due to the elastic deflection and a second term proportional to the square of the speed, which is due to the initial (residual) unbalance. In the case of a balanced rotor with a single unbalanced disc, an elastic deflection also takes place which produces a centrifugal force. The term due to deflection contains the masses of both the single disc and the whole rotor. The term due to the initial unbalance of the single disc contains only the mass of the single disc. Balancing on a balancing machine at low speed proceeds in the absence of elastic deflections. The compensating masses balance only the initial unbalance term but produce no compensation for the elastic deflection term because these compensating masses are attached near the bearings. Thus, an elastic unbalance proportional to the fourth power of the rotational speed remains. If the deflections of the rotor are plotted against speed, the presence of a fourth order parabola betrays the existence of elastic unbalance.

Card 2/3 If so, only the dismantling of the rotor and re-balancing

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S/147/60/000/02/016/020
E191/E481

The Elastic Unbalance in Multi-Disc Turbo-Jet Engine Rotors

of separate discs can cure the vibrations. In a numerical example, a rotor of 500 kg weight is considered at 6700 operating rpm. The elasticity of the rotor is 0.02 microns/kg. Assuming that the single disc and the assembled rotor have the same unbalance moments, it is shown that the elastic unbalance is responsible for a centrifugal force about half that due to the unbalance of the entire rotor. It follows that individual balancing of discs is essential. There are 3 figures and 5 Soviet references.

SUBMITTED: December 15, 1959

4

Card 3/3

SAMAROV, N.G. (Moskva)

Flexible form of the unbalancing of multiple-disk rotors of turbojet engines. Izv. vys. ucheb. zav.; av. tekh. 3 no. 2:138-143 '60. (MIRA 14:5)

(Rotors)

SAMAROV, P.

Safety manuals for oil field workers. Bezop.truda v prom. 2 no.4:37 Ap '58. (MIRA 11:4)

(Oil fields--Safety measures)

SAMAROVA, V. A.

11 H

PROCESSES AND PROPERTIES INDEX

Influence of methylcholanthrene on the reproduction of Paramaecium caudatum. V. Samarova. *Med. expil.* (Ukraine) 1940, No. 4, 61-3 (in Russian, 63; in French, 64).—In a medium of 9 drops of filtered methylcholanthrene water and in 9 drops of water, resp., the reproduction indexes of *P. caudatum* 3 drops of filtered hay infusion were 3.21 and 2.98. Since physicochem. methods do not demonstrate any measurable soly. of methylcholanthrene in H_2O, it is concluded that biol. objects are sensitive to minute quantities of methylcholanthrene not detectable by chemical tests.

C. S. Shapiro

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

SAMAROVA, V.A.

Studying regeneration in anurous amphibians. Uch.zap. KHGU 33:275-291 '50. (MIRA 11:11)

1. Otdel eksperimental'noy zoologii Nauchno-issledovatel'skogo instituta biologii Khar'kovskogo gosudarstvennogo universiteta (direktor - zasluzhennyy deyatel' nauki prof. A.V. Nagornyy, zaveduyushchiy otdelom - prof. E.Ye. Umanskiy).
(Regeneration (Biology)) (Amphibia)

1. UMANSKIY, YE. YE.; SAMAROVA, V. A.

2. USSR (600)

4. Wounds

7. Restraining the development of scar tissue with hyaluronidase, Dokl. AN SSSR, 88, No. 2, 1953.

9. Monthly List of Russian Accessions, Library of Congress, April, 1953, Uncl.

KUDIN, P.V.; BOL'SHAKOVA, K.V.; LEBEDEVA, G.Ya.; SAMARSKAYA, L.L.; PANTSER, I.A.

Treatment of periodontitis with antibiotics. Stomatologiia 40 no.1:25-26 Ja-F '61. (MIRA 14:5)

1. Iz stomatologicheskoy polikliniki Krasnoarmeyskogo rayona Stalingrada (glavnyy vrach P.T.Baranov).
(GUMS—DISEASES) (ANTIBIOTICS)

LAVROV, N.V.; SAMARSKAYA, M.A.

Organic synthesis from carbon monoxide and water vapor. Trudy IGI 11:100-104 '59. (MIRA 13:6)
(Carbon monoxide) (Water vapor)

/.

FRADKIN, Naum Grigor'yevich; SAMARSKAYA, N., red.; KORNEYEVA, V., tekhn.red.

[Birth of the map; pages from the history of geographical discoveries] Rozhdenie karty; stranitsy iz istorii geograficheskikh otkrytii. Moskva, Izd-vo TsK VLKSM "Molodaia gvardiia," 1959. 159 p. (MIRA 12:8)
(Cartography)

SAPARINA, Yelena Viktorovna; SAMARSKAYA, N., red.; MIKHAYLOVSKAYA, N., tekhn.red.

[Surveying from skies] Nebesnyi zemlemer. Moskva, Izd-vo TsK VLKSM "Molodaia gvardiia," 1959. 198 p. (MIRA 13:4)
(Geodesy)

ADABASHEV, Igor' Ivanovich; ANTONYUK, L., red.; SAMARSKAYA, N., red.; KOVALEV, A., tekhn. red.

[Reason against the elements] Razum protiv stikhii. Moskva, Izd-vo TsK VLKSM "Molodaia gvardiia," 1962. 270 p. (MIRA 15:3)

(Disasters)

L 12799-63 BDS
ACCESSION NR: AP3000771 S/0070/63/008/003/0393/0397

AUTHOR: Kitaygorodskiy, A. I.; Myasnikova, R. M.; Samarskaya, V. D. 50 49

TITLE: Mutual solubility of tolan and mercury diphenate in the solid state

SOURCE: Kristallografiya, v. 8, no. 3, 1963, 393-397

TOPIC TAGS: molecular volume, solid solution, organic solids, tolan, mercury diphenate

ABSTRACT: This study is a continuation of work on measuring mutual solubilities of organic substances, carried on for several years at the Institute of Hetero-organic Compounds. The two constituents in the present study have molecules geometrically similar. It was found that the maximum content of tolan in crystals with mercury-diphenate structure is 8.2%, and the maximum content of the diphenate in tolan structure is 14.0%. The authors have constructed diagrams showing composition of the system and have plotted curves relating molecular volume to concentration of admixture in the crystals. Phases with the structure of mercury diphenate show a smooth decline in the curve of molecular volume, but the corresponding curve for tolan passes through a maximum. The authors conclude, particularly from this fact, that it is necessary to have a complete thermodynamic theory in order to explain peculiarities of solubility in such systems. Orig. art. has: 4 figures

Card 1/2

ASS: Institute of Elementoorganic Compounds

L 60300-65 EWA(h)/EWA(c)/EWT(l)/EWT(m)/EWP(b)/T/EWP(t) Peb IJP(c) JD
ACCESSION NR: AT5009444 Z/0000/64/000/000/0096/0101

34
31
B+1

AUTHOR: Alekseevski, N. E.; Kiryanov, A. P.; ~~Samarski, Yu. A.~~ 18

TITLE: The anisotropy of the Mossbauer effect in β-Sn single crystals at 4.2K

21

SOURCE: Conference on Low Temperature Physics and Technieuqes. 3d, Prague, 1963. Physics and technieques of low temperatures; proceedings of the conference. Prague, Publ. House of the Czechosl. Academy of Sciences, 1964, 96-101

TOPIC TAGS: Mossbauer effect, anisotropy, Beta tin, single crystal, low temperature research

27 14

ABSTRACT: The purpose of the experiments was to reconcile the discrepancies observed in the sign of the anisotropy of the Mossbauer effect in different investigations. The resonance absorption was measured with equipment that made it possible to move the absorber with constant velocity relative to the gamma source; the absorber was in direct contact with a helium bath. The resonance absorption in β-Sn single crystals was measured at 4.2 and 80--200K. The absorbers were plates cut from single-crystal metallic tin enriched with Sn^{120}. A diagram of the experimental set-up is shown in Fig. 1 of the Enclosure. The anisotropy of the Mossbauer effect was seen to decrease at low temperatures, but the reasons for this are not yet clear. No inversion of the anisotropy was found at 200K. The values obtained for

Card 1/3

L 60300-65 3

ACCESSION NR: AT5009444

the Lamb-Mossbauer factor were 0.31 ± 0.06 at 80K and 0.42 ± 0.06 at 4.2K. "The authors thank P. L. Kapitsa for encouragement and Professor V. S. Shpinel' and his collaborators for assistance and valuable discussions." Orig. art. has: 3 figures, 4 formulas, and 1 table.

ASSOCIATION: Institute fizicheskikh problem AN SSSR (Institute of Physics Problems AN SSSR)

SUBMITTED: 00 ENCL: 01 SUB CODE: SS

NR REF SOV: 004 OTHER: 002

Card 2/3

L 60300-65

ACCESSION NR: AP5009444

ENCLOSURE: 01

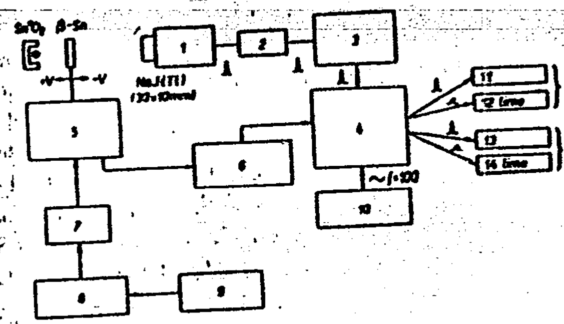

Fig. 1. Schematic diagram of experimental equipment:

1 — NaI(Tl) scintillation counter, 2 — cathode follower, 3 — single-channel pulse-height analyzer, 4 — electronic switch, 5 — cam, 6 — mechanical trigger relay, 7 — electromotor RD-09, 8 — power amplifier UM-50 A, 9 — low-frequency oscillator SG-4, 10 — quartz low-frequency oscillator, 11 — scalers PS-100.

Card 3/3

PA 24T98

SAMARSKIY, A. A.

USSR/Physics Jan 1947
Mesons
Particles, Charged

"The Polarization of Mesotronic Waves When Reflected from a Potential Barrier," A. A. Samarskiy, 7 pp

"Vestnik Moskovskogo Universiteta" No 1

The Reflection of charged mesotrons of Spin I from a potential barrier is considered according to the equations of Prock. It is established that in this case a polarization of mesotronic waves takes place.

24T98

SAMARSKIY, A. A.

Samarsky, A Concerning a problem of the transfer of

1947 ... 1947)

Source: Mathematical Reviews, Vol 10 No. 5

APPROVED FOR RELEASE: 08/25/2000 CIA-RDP86-00513R001446920009-6"

SAMARSKIY, A.A.

2/ Samarskii, A. A. Concerning a problem of the transfer of heat. II. Vestnik Moskov. ... 1947 no. 6, 119–129
Russian ... establish the solu-
...
is also given.

Source: Mathematical Reviews, Vol 11 No.

PROCESSES AND PROPERTIES INDEX

S A

B 6 a

[illegible]. On the excitation of wave guides. L. Samarskii, A. A. and Tikhonov, A. N. *Bull. Acad. Sci. URSS, Sér. Phys.*, 17 (No. 11) 1283-96 (1947) *In Russian.*—The authors examine the excitation of cylindrical waveguides of arbitrary cross-section by a linear current parallel to the axis. The Hertz vector of each current element is obtained by means of an infinite series involving the eigenfunctions of the guide cross-section. The total Hertz vector is then derived using the principle of superposition. The analysis is carried out on a rigorous mathematical basis and an extensive use is made of the properties of Green's functions.

F. B. (R)

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

1ST AND 2ND ORDERS

PROCESSES AND PROPERTIES INDEX

S A

B 66
a

621.392.26 : 538.566

3361. On the excitation of wave guides. II. SAMARSKII, A. A. AND TIKHONOV, A. N. *Bull. Acad. Sci. URSS, Sér. Phys.*, 17 (No. 12) 1432-40 (1947) *In Russian.*—Generalization of Part I, in so far as no restriction is made of the orientation of the exciting current. An elementary current of arbitrary direction is first considered. The electric and magnetic field components parallel to the axis of the guide are derived from the series obtained in Part I, and from there the general electromagnetic field is deduced. The result obtained can then be used to derive by superposition the waves excited in waveguides by any linear current, sheet current or volume current.

Y. B. (R)

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

PA 10/49T38

SAMARSKIY, A. A.

Jul 48

USSR/Electronics
Wave Guides

"Excitation of Wave Guides. III," A. A. Samarskiy, A. N. Tikhonov, Sci Res Inst of Phys, Moscow State U, 15 pp

"Zhur Tekh Fiz" Vol XVIII, No 7

In two previous papers authors examined problem of excitation of a cylindrical wave guide of arbitrary section by means of arbitrary currents within the wave guide. Here authors derive formulas for active part of emission resistance R(ω) of arbitrary current. Submitted 24 Jan 48.

10/49T38

1ST AND 2ND ORDERS

PROCESSES AND PROPERTIES INDEX

3RD AND 4TH ORDERS

N

8

919 The Radiation Principle. A. N. Tikhonov and A. A. Samarskii. Zhur. Eksptl. i Teoret. Fiz. 18, 243-8 (1948)(in Russian).

A general radiation principle is formulated for the wave equation $\Delta v + k^2 v = -F(M)$, where $M = (x,y,z)$; solutions satisfying that principle are limiting solutions, at $t \to \infty$, of Cauchy's problem in which the initial conditions of $u(M,t)$ are $u(M,O) = 0$ and $\frac{\partial u}{\partial t}(M,O) = 0$, and u is the variable in the vibration equation corresponding to the above wave equation. It is shown that, in an unlimited space, the method outlined here leads to solutions satisfying the known condition of radiation of Sommerfeld (Jahresber. deutschen mat. Vereinigung 21, 309(1912)).

COMMON ELEMENTS

OPEN

MATERIALS INDEX

COMMON VARIABLES INDEX

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

AUTHOR INDEX

SAMARSKI, A. A.

621.392.26† 291

On Representing the Field in a Waveguide as a Sum of the TE and TM Fields.—A. A. Samarski & A. N. Tikhonov. (*Zh. tekh. Fiz.*, July 1948, Vol. 18, No. 7, pp. 951-970. In Russian.) It has been stated by various authors without proof that any field in a waveguide can be represented as a sum of the transverse electric field TE and the transverse magnetic field TM. A rigorous mathematical proof is given that any e.m. field in a waveguide can be represented by two Hertzian vectors, each having only one component differing from zero. The problem of determining the e.m. field in a waveguide is then reduced to the problem of finding two scalar functions Z_e and Z_m (transverse components of the electric and magnetic Hertzian vectors).

SAMARSKIY, A.

PA 35/49T52

USSR/Mathematics - Geometry, Abstract Dec 48
Mathematics - Group Theory

"The Effect of Appending a Finite Number of Regions on the Natural Frequency of an Enclosed Space," A. Samarskiy, Moscow State U imeni M. V. Lomonosov, 4 pp

N
611
(4)

"Dok Ak Nauk SSSR" Vol LXIII, No 6

Investigates problem of appending a finite number of regions to enclose spaces: (1) Establishes broadest class of number spaces (nil potential spaces) in which appending does not change the natural frequency. (2) Calculates correction for the natural frequencies for appending on small regions. Submitted

[redacted] 35/49T52

USSR/Mathematics - Geometry, Abstract (Contd) Dec 48

by Acad I. G. Petrovskiy, 25 Oct 48.

[redacted] 35/49T52

SAMARSKIY, A.A.

PA 51/49T103

USSR/Radio Jul 49
Wave Guides
Antennas

"Radiation Resistance of Line Currents," A. A. Samarskiy, A. N. Tikhonov, Moscow State U imeni M. V. Lomonosov, 11 pp

"Zhur Tekh Fiz" Vol XIX, No 7

Studies problem of calculating reactive part of radiation resistance of a line conductor (antenna current distribution being given. Establishes that value of reactance is finite only for the case of a tuned dipole. Gives formulas for re-

51/49T103

[redacted]

USSR/Radio (Contd) Jul 49

reactance of a half-wave dipole in a cylindrical wave guide of arbitrary form. Submitted 24 Jul 48.

51/49T103

[redacted]

SAMARSKIY, A.A.

Mathematical Reviews
May 1954
Analysis

*Tihonov, A. N., i Samarskiĭ, A. A. Uravneniya matematičeskogo fiziki. [The equations of mathematical physics.] Gosudarstv. Izdat. Tehn.-Teor. Lit., Moscow-Leningrad, 1951. 659 pp. 14.80 rubles.

This book consists of three parts: (i) the theory of the equations of mathematical physics; (ii) applications to physical problems; and (iii) special functions. The first part comprises the body of the text. Each of the chapters (except the first) has an appendix which discusses applications to physical problems of the material just presented. The theory of special functions is taken up separately in a special lengthy (about 100 pages) appendix.

The first chapter gives a brief discussion of the classification of second order partial differential equations. Chapters 2, 3, and 4 treat the simplest problems for equations of hyperbolic, parabolic, and elliptic type. The appendices to these chapters take up such topics as the vibrating string and rod, radioactive decomposition, electrostatics, and hydrodynamics.

Chapter 5 is a continuation of chapter 2 and discusses wave propagation in space. The sixth chapter treats heat

(over)

TIKHONOV, A.N.

(2)

diffusion in space while chapter 7 continues the discussion of chapter 4 on elliptic equations. Some of the topics considered in the appendices to these chapters are: elasticity, electromagnetic waves, radio waves on the earth's surface and hollow resonators. Each of the chapters has a set of exercises at the end. The section on special functions develops the theory of Bessel functions, Legendre, Hermite and Laguerre polynomials. A few applications are given.

This book has a wealth of applications, many to topics not usually treated. For example, two applications which the reviewer has not seen elsewhere concern the diffusion of clouds and the influence of radioactivity on the temperature of the earth's core. *M. H. Protter* (Berkeley, Calif.).

11/8/54 LM

SAMARSKIY, A. A.

AID 685 - X

PHASE X TREASURE ISLAND BIBLIOGRAPHICAL REPORT

Call No.: QC20.T54

BOOK
Authors: TIKHONOV, A. N. and SAMARSKIY, A. A.
Full Title: THE EQUATIONS OF MATHEMATICAL PHYSICS. 2-nd ed., rev. and suppl.
Transliterated Title: Uravneniya matematicheskoy fiziki. Izd. 2-e, isprav. i dopol.

PUBLISHING DATA
Originating Agency: None
Publishing House: State Publishing House of Technical and Theoretical Literature
Date: 1953 No. pp.: 679 No. of copies: 25,000
Editorial Staff
Contributors: A. B. Vasil'yeva, V. B. Glasko, V. A. Il'in, A. V. Luk'yanov, O. I. Panych, B. L. Rozhdestvenskiy, A. G. Sveshnikov, D. N. Chetayev and Yu. L. Rabinovich.

PURPOSE AND EVALUATION: Approved by the Main Administration of Higher Education of the Ministry of Culture of the USSR as a textbook for physico-mathematical faculties of state universities. In comparison with Couzant and Hilbert's Methods of Mathematical Physics, this book is suitable only for preliminary study of this subject.

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AID 685 - X

Uravneniya matematicheskoy fiziki.
Izd. 2-e, isprav. i dopol.

TEXT DATA

Coverage: In this book only those problems of mathematical physics are considered which can be solved by using partial differential equations. Only part of material pertaining to the methods of mathematical physics is presented. The theory of integral equations and methods of calculus of variation are not included, and approximate methods set out only to a limited extent.

Table of Contents

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Ch. II	Equations of the Hyperbolic Type	23
Ch. III	Equations of the Parabolic Type	178
Ch. IV	Equations of the Elliptic Type	279
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TIKHONOV, A.N.; SAMARSKIY, A.A.

Magnetization of a magneto-dielectric cylinder with the calculation of magnetic viscosity. Vest.Mosk.un. 8 no.2:43-51 F '53. (MLRA 6:5)

(Electromagnetism)

1. Kafedra matematiki.

Samarskiy, A.A.

USSR/Mathematics

Card 1/1 Pub. 22 - 7/47

Authors : Tikhonov, A. N., member corresp. of the Acad. of Scs. of the USSR; and Samarskiy, A. A.

Title : About discontinuous solutions of quasi-linear equations of the first order

Periodical : Dok. AN SSSR 99/1, 27-30, Nov 1, 1954

Abstract : Analysis of discontinuous solutions of the so-called quasi-linear equations of the $\int_c Adt - Bdx = \iint_s Fdx\,dt$ type is given. The following symbols are explained: s, x, t, c. Two references (1954). Graph.

Institution : Moscow State University im. M. V. Lomonosov

Submitted : ...

AUTHORS: Maslov, V.P., Samarskiy, A.A., Fomin, S.V., and Shirokov, Yu.M. SOV/42-13-6-31/33

TITLE: I.I.Gol'dman and V.D.Krivchenkov, Collection of Problems for Quantum Mechanics, Moscow, Gostekhizdat, 1957, 275 Pages, 15000 Copies, 5 Rub. 15 Kop. (I.I.Gol'dman i V.D.Krivchenkov, Sbornik zadach po kvantovoy mekhanike, M., Gostekhizdat, 1957, str. 275, tirazh 15000 ekz., tsena 5 r. 15 kop)

PERIODICAL: Uspekhi matematicheskikh nauk, 1958, Vol 13, Nr 6, pp 234-237 (USSR)

ABSTRACT: This is a very appreciating review of the above book. For the further editions it is commended to consider the group-theoretical methods of quantum mechanics and to give instructions for some difficult problems.

Card 1/1

SOV/20-121-2-8/53

AUTHOR: Samarskiy, A.A.

TITLE: Equations of Parabolic Type With Discontinuity Coefficients (Uravneniya parabolicheskogo tipa s razryvnymi koeffitsiyentami)

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol 121, Nr 2, pp 225-228 (USSR)

ABSTRACT: On the interval $0 \leq t \leq T$ let in $\overline{D}$ ($\eta_o(t) \leq x \leq \eta_{n+1}(t)$) the pairwise non intersecting curves $\{C_i\}$, $i=0,1,\dots,n+1$ be given by the equations $x = \eta_i(t)$. Let $\eta_{i_1}(t) < \eta_{i_2}(t)$ if $i_1 < i_2$. Let every C_i be differentiable and let $\eta_i'(t)$ satisfy the Hölder condition of the order Υ. In $0 \leq t \leq T$, $\eta_o(t) \leq x \leq \eta_{n+1}(t)$ the author seeks a regular solution of

$$Lu = u_{xx} - u_t - a(x,t)u_x - b(x,t)u(x,t) = -f(x,t),$$

satisfying the initial condition $u(x,0) = \varphi(x)$, the boundary conditions $u(\eta_o(t),t) = u_1(t)$, $u(\eta_{n+1}(t),t) = u_2(t)$ and the conditions of division into pieces on the n curves C_i:

$$[u]_i = 0, \quad [qu_x - ru]_i = 0 \quad \text{for } x = \eta_i(t), \quad i=1,\dots,n,$$

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where $[u_i] = u(\eta_i+0,t)-u(\eta_i-0,t)$ if $a(x,t)$, $b(x,t)$ and $f(x,t)$ are piecewise continuous and piecewise differentiable. By the construction of a source function the given problem is reduced to the solution of an integral equation and this equation is solved by successive approximation. Under very numerous and very strong assumptions on the appearing functions the author finally obtains a theorem of existence and uniqueness. There is 1 English reference.

ASSOCIATION: Otdeleniye prikladnoy matematiki matematicheskogo instituta imeni V.A.Steklova Akademii nauk SSSR (Section for Applied Mathematics of the Mathematical Institute imeni V.A.Steklov)

PRESENTED: March 8, 1958, by M.V.Keldysh, Academician
SUBMITTED: February 27, 1958

SOV/20-122-2-7/42

AUTHOR: Tikhonov, A.N., Corresponding Member of the Academy of Sciences of the USSR and Samarskiy, A.A.

TITLE: On the Representation of Linear Functionals in the Class of Discontinuous Functions (O predstavlenii lineynykh funktsionalov v klasse razryvnykh funktsiy)

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol 122, Nr 2, pp 188-191 (USSR)

ABSTRACT: Let $Q_o(f)$ be the class of the functions piecewise continuous on (a,b). Let the functional $A[f]$ be defined on $Q_o(f)$ by 1.) $A[f_1 + f_2] = A[f_1] + A[f_2]$ 2.) $|A[f]| \leqslant M \sup|f|$. Put

$$\eta_\xi(x) = \begin{cases} 1 & \text{for } a < x < \xi \\ 0 & \text{for } \xi \leqslant x < b \end{cases}$$

$$\pi_\xi(x) = \begin{cases} 1 & \text{for } x = \xi \\ 0 & \text{for } x \neq \xi \end{cases}$$

furthermore put

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SOV/20-122-2-7/42

On the Representation of Linear Functionals in the Class of Discontinuous Functions

$$\alpha(\xi) = A\left[\eta_\xi(x)\right] \quad , \quad \sigma(\xi) = A\left[\pi_\xi(x)\right]$$

Theorem: $A[f] = \int_a^b f(x)\,d\bar{\bar{\alpha}}(x) + \sum_{i=1}^{\infty}\left\{f_r(\xi_i)\left[\bar{\alpha}_r(\xi_i) - \bar{\alpha}(\xi_i)\right] + f_l(\xi_i)\left[\bar{\alpha}(\xi_i) - \bar{\alpha}_l(\xi_i)\right]\right\} + \sum_{j=1}^{\infty}\sigma(\zeta_j)f(\zeta_j)$

Here $\bar{\alpha}(\xi) = \alpha(\xi) - \sum_{\zeta_j<\xi}\sigma(\zeta_j)$, $\bar{\bar{\alpha}}(\xi)$ the continuous part of $\bar{\alpha}(\xi)$, i.e.

$$\bar{\bar{\alpha}}(\xi) = \bar{\alpha}(\xi) - \sum_{\xi_i<\xi}\left[\bar{\alpha}_r(\xi_i) - \bar{\alpha}_l(\xi_i)\right]$$

furthermore $\bar{\alpha}_r(\xi) = \bar{\alpha}(\xi+0)$, $\bar{\alpha}_l(\xi) = \bar{\alpha}(\xi-0)$, there being at most a countable set of points at which $\sigma(\xi) \neq 0$.

Three further theorems deal with the difference of two linear

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On the Representation of Linear Functionals in the Class of Discontinuous Functions SOV/20-122-2-7/42

functionals, give conditions that from $f \geqslant 0$ it follows $A[f] \geqslant 0$ and conditions for $B[f(x)] = A[f(-x)]$.

SUBMITTED: April 20, 1958

Card 3/3

TIKHONOV, A.N.; SAMARSKII, A.A.

Homogeneous difference schemes. Dokl.AN SSSR 122 no.4:562-565 O '58. (MIRA 11:11)

1. Chlen-korrespondent AN SSSR (for Tikhonov).
(Differential equations)

USSR/ Physics - Magnetization FD-3156

Card 1/1 Pub. 153 - 12/26

Author : Tikhonov, A. N; Samarskiy, A. A.

Title : Magnetization of a cylinder with winding taking account of magnetic viscosity

Periodical : Zhur. tekh. fiz., 25, No 13 (November), 1955, 2319-2328

Abstract : The authors consider the following problem: a conducting cylinder of infinite length parallel to the z-axis is situated in a constant magnetic field such that at moment $t=0$ within the cylinder there is established a constant magnetic field of strength H_0 directed along the z-axis; at moment $t=0$ the external field is abruptly changed from $H=H_0$ to $H=H_1$, which can be greater or less than H_0, with the possibility $H_1=0$. They note that the solution on the basis of the Maxwell equations was first obtained by B. A. Vvedenskiy (ZhRFKhO, 55, 1, 1923; see also A. N. Tikhonov, Sbornik statey pod red. V. K. Arkad'yeva, Publishing House of Dept. Tech. Sci. of Acad. Sci. USSR, p. 80, 1938). The aim of the authors in the present article is to solve the problem of magnetic reversal of a conducting cylinder in the presence of not only elastic but also viscous magnetization, a similar problem for the case of plane layer having been considered by A. N. Tikhonov, ZhTF, 7, 38, 1937. The authors acknowledge that the works of R. V. Telesnin (ZhETF, 18, No II, 970, 1948; DAN SSSR, 25, No 5, 1950) suggested the present problem.

Submitted : October 29, 1952

Samarskiy, A.

ALEKSANDROV, P.; SAMARSKIY, A.; SVESHNIKOV, A.

Andrei Nikolaevich Tikhonov; on the occasion of the 50th anniversary of his birth. Usp. mat. nauk 11 no.6:235-245 N-D '56. (MLRA 10:3)
(Tikhonov, Andrei Nikolaevich, 1906)

Samarskiy, A. A.

4

I-F/W

Tihonov, A. N.; and Samarskii, A. A. On finite difference schemes for equations with discontinuous coefficients. [illegible] Akad. [illegible] 108 [illegible]

(Russian)

A numerical method for the approximation of the solution of a class of boundary value problems for linear ordinary differential equations with discontinuous coefficients is considered. A method for replacing derivatives by differences is given together with necessary conditions for determining the difference operator so that the solution of the difference equation should converge to the solution of the differential equation.

C. Saltzer.

68025
SOV/155-58-6-26/36

~~16(1)~~ 16.7600

AUTHORS: Samarskiy, A.A., Fomin, S.V.

TITLE: On the Mathematical Investigation of Sorption- and Desorption Processes of Gases (Quasi-stationary Case)

PERIODICAL: Nauchnyye doklady vysshey shkoly. Fiziko-matematicheskiye nauki, 1958, Nr 6, pp 158-168 (USSR)

ABSTRACT: Through a tube which is filled with an absorbing medium there is sent a mixture of n gases with given concentrations. The process is a purely physical one (absorption of the single components by the medium), chemical interactions do not take place. The velocity ν of the mixture is so high that diffusion is negligible. The concentration c_i of the free gas components and the set a_i of the absorbed gas is sought at an arbitrary moment t at an arbitrary point of the tube. According to [Ref 1] the process is described by 2n differential equations which are linear with respect to the derivatives and non-linear with respect to the sought functions a_i, c_i themselves. Under the assumption that the process

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SOV/155-58-6-26/36

On the Mathematical Investigation of Sorption- and Desorption Processes of Gases (Quasi-stationary Case)

takes place under constant temperature and that the so-called kinetic coefficient is infinitely large, the authors succeed in reducing the originally partial system to a system of n ordinary differential equations of first order. The system is completed by initial- and boundary conditions which correspond to three cases: sorption, desorption and removal of some gases by the others. The authors carry out a qualitative investigation of the obtained boundary value problems and then under further (physically evident) assumptions they describe a method which renders possible the solution of the problem.
There is 1 Soviet reference.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet imeni M.V. Lomonosova (Moscow State University imeni M.V. Lomonosov)

SUBMITTED: October 19, 1958

Card 2/2

16.3500 16.3900 16.6500

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SOV/155-59-1-8/30

~~16(1), 24(8)~~

AUTHOR: Samarskiy, A.A.

TITLE: On the Convergence of the Method of Rothe for the Heat Conductivity Equation With a Discontinuous Coefficient of Heat Conduction

PERIODICAL: Nauchnyye doklady vysshey shkoly. Fiziko-matematicheskiye nauki, 1959, Nr 1, pp 48-53 (USSR)

ABSTRACT: In the rectangle $D = (0 \leq x \leq 1 \;,\; 0 \leq t \leq T)$ the author considers the equation

$$(1) \qquad Pu = \frac{\partial}{\partial x}\left[k(x,t)\frac{\partial u}{\partial x}\right] - \frac{\partial u}{\partial t} = - f(x,t)$$

with the conditions

$$(2) \qquad u(x,0) = \varphi(x)$$

$$(3) \qquad u(0,t) = u_1(t) \quad , \quad u(1,t) = u_2(t)$$

$$(4) \qquad [u]_i = 0 \;,\; [ku_x]_i = 0 \quad \text{for} \quad x = \xi_i(t) \quad , \quad 0 \leq i \leq n$$

where $x = \xi_i(t)$ are curves on which the coefficient $k(x,t)$ is discontinuous.

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67506

SOV/155-59-1-9/30

~~16(1)~~ 16.4100

AUTHORS: Tikhonov, A.N., and Samarskiy, A.A.

TITLE: On the Development With Respect to a Parameter of Integrals the Kernel of Which is of the Type of the δ -Function

PERIODICAL: Nauchnyye doklady vysshey shkoly. Fiziko-matematicheskiye nauki, 1959, Nr 1, pp 54 - 61 (USSR)

ABSTRACT: The authors consider integrals

$$(1)\quad J\left[h,x_o f\right] = \int_a^b \phi(x-x_o, h)f(x)dx \qquad (a < x_o < b)$$

where

$$(2)\qquad \phi(x-x_o, h) = \frac{1}{h}\,\omega\left(\frac{x-x_o}{h}\right).$$

Let $|f(x)| < M$, $a < x < b$, and continuous in $x = x_o$ $(a < x_o < b)$. Let the function $\omega(\xi)$ be absolutely integrable and for $\xi \to \pm\infty$ let it have the development

$$\omega(\xi) = \frac{q_2}{\xi^2} + \frac{q_3}{\xi^3} + \ldots + \frac{q_k}{\xi^k} + \omega_k(\xi), \quad \lim_{\xi\to\infty} \xi^k \omega_k(\xi) = 0$$

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q

SOV/155-59-1-9/30

On the Development With Respect to a Parameter of Integrals the Kernel of Which is of the Type of the δ-Function

Let the function $f(x)$ have a differential of the order $k+1$ in x_o. Under these assumptions there holds the asymptotic development

(4) $J = J_o + hJ_1 + h^2J_2 + \ldots + h^nJ_n + h^n\varrho(h)$,

where $\varrho(h) \to 0$ with $h \to 0$. Here

$$I_k = a_k \frac{f^{(k)}(x_o)}{k!} + q_{k+1} \int_a^b \frac{f_{k-1}(x)dx}{(x-x_o)^{k+1}} - q_{k+1} \sum_{s=0}^{k-1} \frac{f^{(s)}(x_o)}{s!(k-s)} \left[\frac{1}{(b-x_o)^{k-s}} - \frac{1}{(a-x_o)^{k-s}} \right]$$

where $f_k(x)$ is the remainder term of the Taylor development

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On the Development With Respect to a Parameter of SOV/155-59-1-9/30
Integrals the Kernel of Which is of the Type of the δ-Function

of $f(x)$ at the point $x = x_0$ and $a_k = \int_{-\infty}^{\infty} \xi^k \omega_k(\xi) d\xi$ (the integrals are understood in the sense of the principal value at the point $x = x_0$ or $\xi = \pm \infty$).

The proposed method can be extended to the case of several variables.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet imeni M.V.Lomonosova (Moscow State University imeni M.V. Lomonosov)

SUBMITTED: January 7, 1959

Card 3/3

67507

SOV/155-59-1-10/30

~~16(1)~~ 16.4100

AUTHORS: Tikhonov, A.N., and ~~Samarskiy, A.A.~~

PERIODICAL: Nauchnyye doklady vysshey shkoly. Fiziko-matematicheskiye nauki, 1959, Nr 1, pp 62 - 70 (USSR)

TITLE: On the Asymptotic Development of Integrals With a Slowly Decreasing Kernel

ABSTRACT: The authors investigate the asymptotics of the integral

$$(1) \quad J[h, x_0 ; f] = \frac{1}{h}\int_a^b \omega\left(\frac{x-x_0}{h}\right) f(x)dx$$

for $h \to 0$ if the function $\omega(\xi)$ has the form

$$(4') \quad \omega(\xi) = \sum_{k=1}^{n}\left(\frac{q_k}{\xi^k} + \frac{\bar{q}_k}{\xi^{k-1}|\xi|}\right) + \omega_n(\xi) \quad , \omega_n(\xi) = 0\left(\frac{1}{\xi^{n+1}}\right) \text{ for } \xi \to \pm\infty$$

It is shown that under the assumption that $|f(x)| \leq M$ on (a,b) and $f(x)$ in $x_0 (a < x_0 < b)$ has a differential of $(n+1)^{st}$ order, while $\omega(\xi)$ is absolutely integrable, there

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On the Asymptotic Development of Integrals With a Slowly Decreasing Kernel SOV/155-59-1-10/30

holds the asymptotic development

$$J = \sum_{s=0}^{n} (\hat{J}_s \ln h + J_s) h^s + h^n \varsigma(h)$$

$(\varsigma(h) \to 0$ for $h \to 0)$, where

$\hat{J}_s = -(q^+_{s+1} - q^-_{s+1}) \cdot \frac{f^{(s)}(x_0)}{s!}$ and $_s$ can be represented by a certain combination of sums and integrals.

There is 1 Soviet reference.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet imeni M.V.Lomonosova (Moscow State University imeni M.V. Lomonosov)

SUBMITTED: January 14, 1959

Card 2/2

16(1) SOV/20-124-3-9/67

AUTHORS: Tikhonov, A.N. Corresponding Member, Academy of Sciences, USSR and Samarskiy, A.A.

TITLE: On the Convergence of Difference Schemes in the Class of Discontinuous Coefficients (O skhodimosti raznostnykh skhem v klasse razryvnykh koeffitsiyentov)

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 124, Nr 3, pp 529-532 (USSR)

ABSTRACT: The authors consider so-called conservative and quasi-conservative difference schemes for the equation

$$Lu \equiv \frac{d}{dx}\left[\frac{1}{p(x)}\frac{du}{dx}\right] = -f(x) , \quad 0<x<1 , \quad 0<m\leq p(x)\leq M ,$$

where $p(x)$ possesses points of discontinuity. Rather complicated necessary conditions of convergence are given. The general type of the difference schemes satisfying these conditions is determined. Altogether there are given 2 theorems and 3 lemmata.

Card 1/2

SOV/20-124-3-9/67

On the Convergence of Difference Schemes in the Class of Discontinuous Coefficients

There are 4 Soviet references.

ASSOCIATION: Matematicheskiy institut imeni V.A. Steklova AN SSSR (Mathematical Institute imeni V.A. Steklov AS USSR)

SUBMITTED: October 13, 1958

Card 2/2

12

SOV/20-124-4-13/67

16(1)

AUTHORS: Tikhonov, A.N. (Corresponding Member, AS USSR) and Samarskiy, A.A.

TITLE: One of the best Homogeneous Difference Schemes (Ob odnoy nailuchshey odnorodnoy raznostnoy skheme)

PERIODICAL: Doklady Akademii nauk, 1959, Vol 124, Nr 4, pp 779-782 (USSR)

ABSTRACT: The present paper is a continuation of [Ref 1]. In [Ref 1] the conditions of convergence of the difference scheme $h^{(p)}$ are given which is used for the solution of

$$\frac{d}{dx}\,\frac{1}{p(x)}\,\frac{du}{dx} = -f(x).$$

In the present paper the authors investigate which of these schemes have a second integral order of exactness. It is shown that there exists only one such "best" scheme; for f(x) 0 it is the scheme:

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One of the Best Homogeneous Differences Schemes SOV/20-124-4-13/67

$$\Lambda_h^{(p)} y_i = \frac{1}{h^2}\left(\frac{y_{i+1} - y_i}{A_{i+1}} - \frac{y_i - y_{i-1}}{A_i}\right), \quad A_i = \int_1^0 p(x_i + sh)\,ds = \frac{1}{h}\int_{x_{i-1}}^{i} p(x)\,dx$$

A similar uniquely "best" scheme exists for f(x) 0.
Ther are 4 Soviet references.

SUBMITTED: October 13, 1958

Card 2/2

16(1) SOV/20-126-1-6/62

AUTHORS: Tikhonov, A.N., Corresponding Member, Academy of Sciences, USSR, Samarskiy, A.A.

TITLE: Asymptotic Expansion of Integrals With Slowly Decreasing Kernel (Asimptoticheskoye razlozheniye integralov s medlenno ubyvayushchim yadrom)

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 126, Nr 1, pp 26 - 29 (USSR)

ABSTRACT: Let h be a small positive parameter ; $a < x_0 < b$;

$$\omega(\xi) = \sum_{k=1}^{n} \frac{q_k^+}{\xi^k} + \omega_n^+(\xi), \quad \omega_n^+(\xi) = 0\left(\frac{1}{\xi^{n+1}}\right) \text{ for } \xi \to +\infty ;$$

$$\omega(\xi) = \sum_{k=1}^{n} \frac{q_k^-}{\xi^k} + \omega_n^-(\xi), \quad \omega_n^-(\xi) = 0\left(\frac{1}{\xi^{n+1}}\right) \text{ for } \xi \to -\infty .$$

Let the boundary values $q_1^+ = \lim_{\xi \to \infty} \xi\omega(\xi)$ and $q_1^- = \lim_{\xi \to -\infty} \xi\omega(\xi)$

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be different in general.
Fundamental theorem: For $h \to 0$ the integral

$$I\left[h ; x_0 ; f\right] = \frac{1}{h}\int_a^b \omega\left(\frac{x-x_0}{h}\right) f(x)dx$$

has the asymptotic expansion

$$I = \sum_{k=0}^{n} (\hat{I}_k \ln h + I_k)h^k + h^n \varrho(h) \quad , \quad \varrho(h) \to 0 \quad \text{for} \quad h \to 0 \; ,$$

if the following conditions are satisfied :
1.) $f(x)$ is bounded on (a,b) and has a differential of order $(n + 1)$ in x_0 .
2.) $\omega(\xi)$ is absolutely integrable on every finite interval.
The following denotations are used :

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Asymptotic Expansion of Integrals With Slowly Decreasing Kernel

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$$\hat{I}_k = -(q^+_{k+1} - q^-_{k+1}) \frac{f^{(k)}(x_o)}{k!}$$

$$I_k = \left[C_k + q^+_{k+1} \ln(b - x_o) - q^-_{k+1} \ln(x_o - a)\right] \frac{f^{(k)}(x_o)}{k!} +$$

$$+ q^+_{k+1} \int_{x_o}^{b} \frac{f_k(x)dx}{(x-x_o)^{k+1}} + q^-_{k+1} \int_{a}^{x_o} \frac{f_k(x)dx}{(x-x_o)^{k+1}} -$$

$$- \sum_{s=0}^{k-1} \frac{f^{(s)}(x_o)}{s!(k-s)} \left[\frac{q^+_{k+1}}{(b-x_o)^{k-s}} - \frac{q^-_{k+1}}{(x_o-a)^{k-1}}\right]$$

$$C_k = \int_{-1}^{+1} \Omega_k(\xi)d\xi + \int_{1}^{\infty}\left[\bar{\Omega}^+_1(\xi) + \bar{\Omega}^-_k(-\xi)\right]d\xi;$$

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$f^{(k)}(x_0)$ is the k-th derivative in the point x_0 ; $f_k(x)$ is the remainder term of the Taylor series ;

$$\Omega_k(\xi) = \begin{cases} \xi^k \omega_k^+(\xi) & \text{for} \quad \xi > 0 \\ \xi^k \omega_k^-(\xi) & \text{for} \quad \xi < 0 . \end{cases}$$

$$\bar{\Omega}_k(\xi) = \xi^k \omega_{k+1}(\xi)$$

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ACCESSION NR: AR4031072

SOURCE: Referativny*y zhurnal. Matematika, Abs. 2B358

AUTHOR: Samarskiy, A. A.

TITLE: Parabolic equations with discontinuous coefficients and various methods of solving them

CITED SOURCE: Tr. Vses. soveshchaniya po differ. uravneniyam, 1958. Yerevan, AN Arm.SSR, 1960, 148-160

TOPIC TAGS: discontinuous coefficient parabolic equation, boundary value problem, Zhevrey transform, Gyol'der continuous function, Gyol'der continuous derivative, Gyol'der condition, Rote differential-difference problem, integro-interpolational method, homogeneous difference scheme, quasi-linear equation, heat-transfer

TRANSLATION: On the domain

$$\overline{D}\,(\eta_0(t) < x < \eta_{n+1}(t),\ 0 < t < T)$$

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the author considers the first boundary value problem for the equation

$$u_{xx}-u_t-a(x,t)u_x-b(x,t)u+f(x,t)=0, \qquad (1)$$

to which a general parabolic equation can be reduced using the Zhevrey transform.

It is assumed that the functions a, b, f are Gyol'der-continuous on $\bar{D}$ with index $\gamma_0 > 1/2$ along t and index $\varkappa > 0$ along x, with the exception of a finite number of mutually non-intersecting curves $\{\eta_i(t)\}$ $(i = 1, 2, \ldots, n)$, lying inside D. The curves $\eta_i(t)$ $(0 \leq i \leq n+1)$ possess Gyol'der continuous derivatives with respect to t with index γ_0, on which a, b, and f can have discontinuities of the first kind. The initial conditions $u(x, 0) = \varphi(x)$ have piecewise continuous derivatives $\varphi'(x)$ and $\varphi''(x)$ which satisfy the Gyol'der condition in the intervals $\eta_i(0) < x < \eta_{i+1}(0)$, $0 \leq i \leq n$. The boundary conditions possess Gyol'der continuous first derivatives with index γ_0. On lines of discontinuity, linear conditions are given for joining u and u_x with the Gyol'der continuous coefficients.

The author proves the existence and uniqueness of a solution to the

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proposed problem in a class of functions which possess Gyol'der-continuous derivatives u_x, u_t, and u_{xx} on

$$\Delta_i = (\eta_i(t) < x < \eta_{i+1}(t),\ 0 < t < T),\ 0 < i < n.$$

For the equation

$$\frac{\partial}{\partial x}\left[k(t,x)\frac{\partial u}{\partial x}\right] - \frac{\partial u}{\partial t} + f(x,t) = 0, \qquad (2)$$

$$(x,t) \in R\{0 < x < 1,\ 0 < t < T\},$$

which, when reduced to the form of (1), satisfies the conditions enumerated above along with the initial and boundary conditions, the author considers the Rote differential-difference problem, and using the integro-interpolational method he constructs a homogeneous difference scheme. He then proves that 1) when $\tau \rightarrow 0$ the solution of the differential-difference equation converges on $\bar{R}$ to the solution of the first boundary value problem for equation (2); and 2) when $h^2/\tau \rightarrow 0$ and $\tau \rightarrow 0$ (h is a step with respect to x,

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τ is a step with respect to t) the solution of the homogeneous difference scheme converges on $\bar{R}$ to the solution of the first boundary value problem for equation (2).

The author concludes by studying different methods for solving quasi-linear heat-transfer equations and proves their convergence. He shows that the results can be carried over to the case of third type boundary conditions. Ye. Volkov

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C111/C444

16.3900

AUTHORS: Tikhonov, A. N., Samarskiy, A. A.

TITLE: On the best schemes of differences

PERIODICAL: Referativnyy zhurnal, Matematika, no. 2, 1962, 31 abstract 2V171. ("Tr. Vses. soveshchaniya po differentsial'n. uravneniyam, 1958". Yerevan. AN Arm SSR, 1960, 167-178)

TEXT: One constructs the equation of differences which in a certain sense is the best one in order to approximate the differential equation

$$\frac{d}{dx}\left(k(x)\frac{du}{dx}\right) - q(x)\,u + f(x) = 0 \qquad (1)$$

with piecewise continuous coefficients. If on the intervals of continuity the functions q and f are twice, and k is three times continuously differentiable, and if the coefficients of the equation of differences are functionals of k, q, f, satisfying certain natural restrictions, then the constructed equation of differences has the second order of exactness, i. e. its solution is different by $O(h^2)$, where h is the lattice step, from the solution of the boundary value

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On the best schemes of differences

problem (1). It is shown that the equation of differences which satisfies all the proposed demands and possesses the second order of exactness, is uniquely determined. Proofs are not given. A great deal of the results had been formerly published by the authors. (RZh Mat, 1960, 4570, 14419).

[Abstracter's note: Complete translation.]

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S/020/60/131/04/13/073

16.6500, 16.3900, 16.3400

AUTHORS: Tikhonov, A.N., Corresponding Member AS USSR, and Samarskiy, A.A.

TITLE: Standard Homogeneous Difference Circuits

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol.131, No.4, pp.761-764.

TEXT: The present paper is a continuation and a partial generalization of the earlier investigations of the authors (Ref.1-4). The authors consider homogeneous three-point-difference schemes for the solution of the boundary value problem

$$L^{(k,q,f)}u = \frac{d}{dx}\left[k(x)\frac{du}{dx}\right] - q(x)u + f(x) = 0, \qquad 0<x<1 \tag{1}$$

$$u(0) = \mu_1 \qquad u(1) = \mu_2.$$

The coefficients of the schemes are determined by certain nonlinear functionals, where the class of the admitted functionals is greater than in (Ref.3,2), so that the difference schemes are more general. If the functionals especially do not depend on the step h, then the scheme is called canonical (standard circuit). The authors investigate the order of exactness of the proposed schemes as well as of the error which appears

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Standard Homogeneous Difference Circuits S/020/60/131/04/13/073

during the solution of a single boundary value problem. There are 4 Soviet references.

SUBMITTED: December 31, 1959

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S/020/60/131/06/010/071

AUTHORS: Tikhonov, A. N., Corresponding Member of the Academy of Sciences USSR, and Samarskiy, A. A.

TITLE: Coefficient Stability of Difference Circuits

PERIODICAL: Doklady Adademii nauk SSSR, 1960, Vol. 131, No. 6, pp. 1264-1267

TEXT: Let the boundary value problem

$$(1)\quad L^{(p,q,f)}u = \frac{d}{dx}\left[\frac{1}{p(x)}\frac{du}{dx}\right] - q(x)u + f(x) = 0, \quad 0<x<1$$

$$u(0) = \mu_1, \qquad u(1) = \mu_2,$$

be considered, the coefficients of which are piecewise continuous and bounded. Let $s_N = \{x_0 = 0,\ x_1 = h,\ \dots,\ x_i = ih,\ \dots,\ x_N = Nh = 1\}$ and

$$(3)\quad L_h^{(p,q,T)} = \frac{1}{h^2}\left[(y_{i+1} - y_i)/B_i^h - (y_i - y_{i-1})/A_i^h\right] - D_i^h y_i + F_i^h .$$

$$A_i^h = A^h[\bar{p}_i(s)],\quad B_i^h = B^h[\bar{p}_i(s)],\quad -1 < s < 1,\quad \bar{p}_i(s) = p(x_i + sh).$$

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Coefficient Stability of Difference Circuits

$$D_i^h = D^h[q(x_i+sh)], \quad F_i^h = F^h[f(x_i+sh)], \qquad -0.5 < s < 0.5 .$$

The functionals A^h, B^h, D^h, F^h are assumed to satisfy the assumptions A_1, A_2, A_3 from (Ref.1), the D^h, F^h to be linear.
L_h is called conservative if $B_i^h = A_{i+1}^h$
Let y_i and $\tilde{y}_i$ be solutions of the problems

$$(8) \quad L_h^{(p,q,f)} y_i = 0, \qquad 0 < i < N, \quad y_0 = \mu_1, \quad y_N = \mu_2$$

and

$$\tilde{L}_h^{(p,q,f)} \tilde{y}_i = 0, \qquad \tilde{y}_0 = \mu_1, \quad \tilde{y}_N = \mu_2,$$

where

$$(9) \quad \tilde{L}_h^{(p,q,f)} \tilde{y}_i = h^{-2}(\Delta y_i | \tilde{B}_i^h - \nabla y_i | \tilde{A}_i^h) - \tilde{D}_i^h y_i - \tilde{F}_i^h$$

X

(3) is called stable in coefficients, if from

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$$\sum_{i=1}^{N-1} |\tilde{A}_i^h - A_i^h| h = \varrho(h), \quad \sum_{i=1}^{N-1} |\tilde{B}_i^h - B_i^h| h = \varrho(h)$$

$$\sum_{i=1}^{N-1} |\tilde{D}_i^h - D_i^h| h = \varrho(h), \quad \sum_{i=1}^{N-1} |\tilde{F}_i^h - F_i^h| h = \varrho(h) \tag{10}$$

where $\varrho(h) \to 0$ for $h \to 0$ it follows

$$|\tilde{y}_i - u(x_i)| \leq \varrho_0(h) \longrightarrow 0 \quad \text{for } h \to 0 \tag{11}$$

($u(x)$ is solution of (1)).
It is shown (theorem 4) that it is necessary and sufficient for the stability in coefficients of (3) that (3) is conservative.

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Coefficient Stability of Difference Circuits

The authors give 7 theorems and 2 lemmata.
There are 4 Soviet references.

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16.3900

AUTHORS: Tikhonov, A. N., Samarskiy, A. A.

TITLE: Uniform difference schemes

PERIODICAL: Referativnyy zhurnal. Matematika, no. 6, 1962, 24-25, abstract 6V131 (Zh. vychisl. matem. i matem. fiz., v. 1, no. 1, 1961, 5-63)

TEXT: Results obtained by the authors and published from 1956 to 1960 (RZhMat, 1959, 9482 and 10155; 1960, 3453, 4570, 12120, 14419; 1961, 1V244, 1V245, 10V221) are analyzed with substantial revisions. Uniform schemes are studied for the solution of the first boundary value problem

$$L^{(k,q,f)}u = \frac{d}{dx}\left[k(x)\frac{du}{dx}\right] - q(x)u + f(x) = 0 \quad (0<x<1) \qquad (1)$$

$$u(0) = \overline{u_1}, \quad u(1) = \overline{u_2},$$

where the coefficients k, q, f are piecewise continuous functions $(k, q, f \in Q^{(0)})$ with $k(x) \geqslant M > 0$ and $q(x) \geqslant 0$. The characteristic of the

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family of difference schemes for differential equation (1) in class $Q^{(0)}$ of piecewise continuous coefficients is given in §1. The authors examine the three-point uniform difference schemes $L_h^{(k,q,f)}$, which are characterized by the linear generating function

$$\phi^h\left[\bar{u}(m),\ \bar{k}(s),\ \bar{q}(s),\ \bar{f}(s)\right] = \frac{1}{h^2}\left[B^{(h,\bar{k})}(\bar{u}_1-\bar{u}_o) - A^{(h,\bar{k})}(\bar{u}_o-\bar{u}_{-1})\right] - D^{(h,\bar{q})}\bar{u}_o + F^{(h,\bar{f})},$$

where each of the coefficients is a functional of only one coefficient of equation (1):

$$A^{(h,\bar{k})} = A^h\left[\bar{k}(s)\right],\quad B^{(h,\bar{k})} = B^h\left[\bar{k}(s)\right]\qquad (-1\leqslant s\leqslant 1),$$

$$D^{(h,\bar{q})} = D^h\left[\bar{q}(s)\right],\quad F^{(h,\bar{f})} = F^h\left[\bar{f}(s)\right].$$

D^h and F^h are linear functionals. The error in the approximation of the scheme $\varphi(\bar{x},u,h) = (L_h^{(k,q,f)}u)_{x=\bar{x}} - (L^{(k,q,f)}u)_{x=\bar{x}}$, where q(x) is the solution of equation (1), is investigated. For this purpose the function $\varphi(\bar{x},u,h)$ is expanded with regard to the parameter h and the coefficients at the powers of h are calculated up to the r-th order. This is possible on the assumption that the master functionals A^h, B^h, D^h, F^h have derivatives of the corresponding orders both for the parameter h and for their own functional argument. A determination of the rank of the functional, including requirements for differentiability, uniformity, monotonicity, and normalization, is carried out. Proceeding from the concept of rank of the functional, the authors study different classes $\mathcal{L}(n_1, n_2, n_3)$ of schemes in which the functionals A^h and B^h have the rank n_1, D^h and F^h the ranks n_2 and n_3, respectively, and are determined on the interval $-0.5 \leqslant s \leqslant 0.5$. Special families of schemes - conservative, discrete, and canonical - are examined. The necessary and sufficient conditions of the n^{th} order of approximation of the scheme

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Uniform difference schemes.

$L_h^{(k,q,f)}$ (n = 1.2) from class $\mathcal{L}(n + 1, n, n)$ are given in the form of a series of correlations for the moments of the master functionals. Problems associated with the convergence and accuracy of the uniform difference schemes in the class of smooth coefficients $C^{(m)}$ are studied in §2. Using the apparatus of Green's difference function for the operator $L_h^{(k,q)}$ the authors demonstrate that a necessary and sufficient condition is the n^{th} order of approximation if the scheme $L_h^{(k,q,f)}$ from class $\mathcal{L}(n + 1,n,n)$ for $k(x)\in C^{(m_k)}$, $m_k \geqslant n + 1$, $q(x)\in C^{(m_q)}$, $m_q \geqslant n$, $f(x)\in C^{(m_f)}$, $m_f \geqslant n$ is to have the n^{th} order of accuracy. Uniform lower and upper bounds are given for Green's difference function. In the study of the convergence and accuracy in the class of smooth coefficients the norm $\|\psi\| = \max_{o\leqslant i\leqslant n}|\psi_i|$, and in the class of discontinuous coefficients the norms $\|\psi\|_3 = \sum_{i=1}^{N-1}|\psi_i|h$ and

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$\|\psi\|_2 = \sum_{i=1}^{N-1} h \left| \sum_{s=1}^{i} \psi_s h \right|$ are used. The order of accuracy and that of approximation of the scheme $L_h^{(k,q,f)}$ in class $C^{(m)}$ coincide, but in the class of discontinuous coefficients, as is shown by an example, this is not so. The error of approximation φ_n^h and φ_{n+1}^h where $x = x_n, x = x_{n+1}$, i.e. at net points adjacent to the point of discontinuity $\xi (x_n \leqslant \xi \leqslant x_{n+1})$ of the coefficient $k(x)$, tends to infinity for $h \to 0$. However, in §3 it is shown that the solution of the difference equation will converge to the solution of equation (1) if the scheme $L_h^{(k,q,f)}$ in class $Q^{(m)}$ satisfies the necessary condition

$$\Delta(\xi,h) = h(B_n^h \varphi_{n+1}^h + A_{n+1}^h \varphi_n^h) = \varrho(h) \to 0 \qquad (2)$$

or

$$\frac{B_n^h B_{n+1}^h}{k_n} - \frac{A_n^h A_{n+1}^h}{k_1} = \varrho(h) \to 0 \text{ for } h \to 0, \qquad (2')$$

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Uniform difference schemes

where $k_1 = k(\xi - 0)$, $k_n = k(\xi + 0)$. If the scheme $L_h^{(k,q,f)}$ in $Q^{(m)}$ is to have the 2nd order of accuracy, the following conditions must be fulfilled:

$$h^2\varphi_n^h = O(h^2),\ h^2\varphi_{n+1}^h = O(h^2),\quad \Delta(\xi,h) = O(h^2).$$

Any conservative scheme of zero rank satisfies the necessary condition of convergence. For a scheme of type $L(1, 0, 0)$ condition (2) is a sufficient condition of convergence in the class of coefficients $k(x)\in Q^{(1)}$, q, $f\in Q^{(0)}$. In §4 a norm of perturbation of the coefficients of the scheme is introduced and a definition of coefficient stability of the difference scheme is given. With a small distortion of the coefficients of the scheme the "perturbed" scheme must converge when $h \to 0$ in $Q^{(m)}$, i.e.

$\|\tilde{y} - u\|_1 = \varrho(h) \to 0$ when $h \to 0$ if $\|\tilde{A}^h - A^h\|_3 = \sum_{i=1}^{N-1} |\tilde{A}_i^h - A_i^h| h = \varrho(h)$,

$\|\tilde{B}^h - B^h\|_3 = \varrho(h)$, $\|\tilde{D}^h - D^h\|_3 = \varrho(h)$, $\|\tilde{F}^h - F^h\|_3 = \varrho(h)$, (all values of

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